**RESEARCH CALL TO DOE/FEDERAL LABORATORIES**

# Technical Support for Interconnection-Level Electric Infrastructure Planning
**RC-BM-2010**

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**This Research Call uses funding from "The American Recovery and Reinvestment Act of 2009" and will be subject to special reporting requirements. The reporting requirements and other details will be provided later.**

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## SECTION I – GENERAL INFORMATION

### A. BACKGROUND INFORMATION

DOE and NETL published Funding Opportunity Announcement (FOA) DE-FOA0000068 on June 15, 2009, inviting applications for a total of $60 million in funds for interconnection-level analysis and planning provided by the American Recovery and Reinvestment Act of 2009. As stated in the FOA (pp. 5-6),

> The objective of this … Announcement is to facilitate the development or strengthening of capabilities in each of the three interconnections serving the lower 48 states of the United States, to prepare analyses of transmission requirements under a broad range of alternative futures and develop long-term interconnection-wide transmission expansion plans. The interconnections are the Western Interconnection, the Eastern Interconnection, and the Texas Interconnection.
>
> The President's goals relating to clean electricity cannot be achieved without an adequate electricity delivery system. Robust transmission and distribution networks are essential to enable the development, integration, and delivery of new renewable and other low-carbon resources, and the use of low-carbon electricity to displace petroleum-based fuels from the transportation sector.
>
> The successful completion of projects awarded as a result of this FOA will provide the following benefits:
>
> - Regional, inter-regional, and interconnection-level coordination will be improved among electric industry organizations and states with respect to long-term electricity policy and planning. In the Eastern U.S., new interconnection-level entities have been established to facilitate this coordination, perform needed analyses, and develop interconnection-level plans. In all parts of the U.S., such improved coordination is essential to achievement of timely development of additional low-carbon generation capacity and its associated transmission requirements.
>
> - The quality of the information available to industry planners and state and federal policymakers and regulators will be substantially improved. For each interconnection, a balanced portfolio of electricity supply futures will be produced and maintained, and the transmission requirements associated with each future will be determined. States that need to develop strategies in coordination with their neighbors will be able to draw on a shared and transparent body of analyses.
>
> - Long-term transmission requirements under a wide range of futures will become more apparent to many stakeholders. Broader awareness of the need for the key facilities included in collaboratively-developed transmission plans will facilitate more timely resolution of issues related to cost allocation and siting of these facilities.

- Facilitating and accelerating the development of important new transmission facilities will, in many cases, facilitate and accelerate the development of renewable or other low-carbon generation capacity.

DOE announced its award selections on December 18, 2009. Two entities were selected in both the Eastern Interconnection and the Western Interconnection, and one in the Texas Interconnection (ERCOT). In the Eastern Interconnection, the selections were the Eastern Interconnection Planning Coalition (EIPC) and the Eastern Interconnection States Planning Council (EISPC). Both entities are to make arrangements for interested non-governmental organizations (NGOs) to participate in their activities, and the two entities are to collaborate in the development of long-term interconnection-level transmission plans. Similarly, in the Western Interconnection, the Western Electricity Coordinating Council (WECC) and the Western Governors' Association (WGA) were selected, and with the participation of interested NGOs, are to collaborate in the preparation of long-term interconnection-level plans. In the Texas Interconnection, one hybrid industry-state entity, the Electric Reliability Council of Texas (ERCOT) was selected to perform these functions within its footprint.

The entities that DOE has selected under FOA 0000068 will perform challenging and important analyses and collaboratively develop much-needed long-term-transmission plans. They will, however, need research support and technical assistance on a variety of key subjects. The fundamental purpose of this Research Call is to invite the National Laboratories to indicate their interest, understanding, and qualifications for providing this research support and technical assistance. It will be important, however, for the work products developed by the selected labs to be timely and designed to mesh with the overall planning processes managed by the FOA selectees.

DOE recognizes that the labs may wish to ask questions of the FOA 0000068 awardees in order to gain better understanding of what the awardees expect their major needs will be and when they are likely to need various work products. To help facilitate in answering these questions, proposers shall forward all inquires to the DOE representative listed in Section IV – Submission Requirements. The DOE will then contact awardee's and post all questions and responses at the following link:

http://www.netl.doe.gov/business/faq/faqs-FOA0000068.html

All names and contact information of proposers posing questions will be kept confidential. Awardees under FOA 0000068 are not to be contacted by the proposers. The FAQ link will be available for 60 days after May, 1 2010

DOE will administer Research Call awards to ensure the proper support is provided to Interconnection recipients. These awards should be considered separate projects from the awards made by the DOE in Funding Opportunity Announcement DE-FOA0000068.

The call invites DOE's National Laboratories to submit applications to do research in four technical areas of interest:

- Interregional electricity reliability issue assessment and analysis

- Possible impacts of new technologies on electricity demand, and comparison of utility resource plans
- Water/energy nexus
- Technical assistance to electric infrastructure planners on other subjects

## B. TECHNICAL AREAS OF INTEREST

In each of the four technical areas of interest described in this call, DOE expects to issue one or more awards. Each award will go to a single National Lab (the "lead Lab") to organize and coordinate all activities required to execute the scope of work. The lead Lab will be expected to provide these services to DOE through combinations of its own staff and collaborators selected by the lead Lab in consultation with DOE. DOE wishes to ensure that the teams that will provide assistance to the FOA 68 selectees represent the best available expertise on the subjects of concern. For this reason, it will be important for the labs to establish arrangements to identify and collaborate with appropriate experts outside their own organizations. Collaborators may include key experts and staff from other National Labs, universities, and private firms. In responding to this call, Labs may seek the lead Lab role in one more of the four technical areas of interest, and should present the qualifications of the team they propose for work in that area.

Described below are the technical areas of interest that the DOE is pursuing. It should be noted that the DOE reserves the right to expand upon and/or make changes to these areas as the situation warrants and that the recipient should plan for such if new information and requests from the FOA recipients becomes available. While this research call is in support of the FOA recipients, it is the DOE that has direct oversight to all selections, awards and project management made under this research call.

### Area of Interest 1: Interregional Electricity Reliability Issue Assessment and Analysis

**Need/Purpose:** The changing composition of the generation fleet and the loads comprising the US electric power system requires detailed review, assessment, and analysis to anticipate and address emerging reliability challenges – before they become manifest in large scale blackouts and other reliability problems. Two examples illustrate the range of issues that must be considered. First, an unprecedented shift to variable renewable sources of electric generation will affect requirements for flexible generation capacity, generation reserves, demand-side resources, and ancillary services. As evidenced by the Federal Energy Regulatory Commission's (FERC) recent focus on this topic, the frequency response characteristics of our evolving generation fleet is an emerging area of concern. Second, the composition of the loads served is also changing. New monitoring technologies confirm that these changes have led in some situations to unexpected voltage conditions – conditions that were not predictable with current modeling tools. In both examples, detailed analysis is required, often involving very large amounts of data, to monitor how the grid is being affected and how to use this information to improve the models used by industry to study corrective actions and develop appropriate grid management tools.

**Scope:** The lead Lab is expected work closely with DOE leadership to identify, prioritize, and appropriately staff needed activities. In addition, it will be essential that all activities be undertaken and executed in close coordination with industry (the North American Electric Reliability Corporation (NERC), Regional Transmission Organization's (RTO) and Independent System Operator's (ISO), utilities, utility trade associations, and equipment manufacturers). It is expected that the lead Lab will be supporting and explicitly leveraging industry-led activities, rather than performing stand-alone activities with little or no industry involvement. The Department expects the lead Lab to focus initially on two priorities that have already been identified by NERC's Transmission Issues Subcommittee: Data collection and model validation for interconnection frequency response; and model development and validation for fault-induced delayed voltage recovery. Additional issues of concern in this area are likely to be identified and analyzed during the 3-year period covered by this research call.

## Area of Interest 2: New Technologies, Electricity Demand, and Utility Resource Plans

### a) Western Interconnection

### Project 1 - New Technologies and Electricity Demand

**Need/Purpose:** Many new technologies have recently appeared or are emerging that will significantly expand the implications of demand-side resources for purposes of transmission planning. The purpose of this work is to significantly improve the knowledge base pertaining to these resources and the treatment of these resources in the models used for long-term infrastructure analysis and planning.

**Scope:** National laboratory support is needed to accurately estimate the demand-side resource technical and economic potential in the power system. Expected activities include quantifying the embedded demand-side impacts for existing policies in current load forecasts; estimating the incremental economic and market-achievable potential of energy efficiency in 10-year WECC load forecasts; estimating the technical potential of energy efficiency for 20-year load forecasts; apply and update FERC's *A National Assessment of Demand Response Potential* for derivation of demand response resource potential in load forecasts 10-years and 20-years in the future; assess combined heat and power resources and potential distributed generation resources; and evaluate distribution system efficiency upgrades. Technical assistance is needed to assemble and evaluate existing studies on demand-side resources and to harmonize and aggregate or extrapolate results as necessary to cover data gaps across the Western Interconnection. The emphasis will be on identifying studies that are of high quality and that have been completed recently enough to capture key changes in federal (and state) appliance and lighting efficiency standards. This task will require the lead National Lab to monitor and coordinate closely with efforts by WECC and the WGA's State/Provincial Steering Group on demand side issues and its efforts to improve the quality of demand side information submitted to WECC by Balancing Authorities.

### Project 2 – Utility Resource Plans: Comparative Review and Analysis

**Need/Purpose:** The Western Governors Association's State-Provincial Steering Committee has requested that WECC construct a reference case that includes aggregated integrated resource plans (IRPs) and other utility planning assumptions, with review by state regulatory authorities, for transmission planning. Such a reference case would reflect the existing resource priorities and requirements in the West. In long-term transmission and other infrastructure planning, it is very important to be clear and specific about the changes from today's circumstances that are expected to occur in the reference case, and additional changes that could be expected under alternative cases.

**Scope:** In this task, a National Laboratory (with assistance from other organizations if the lab so proposes) will review, analyze and synthesize information in utility resource plans in the Western Interconnection and state policies and laws that WGA members may draw upon in developing inputs into the regional transmission planning process in Western Interconnection. Review and analysis of recent utility resource plans may include: compiling information on the composition of the preferred resource portfolios identified in resource plans, in terms of capacity and energy additions by technology type (including both supply- and demand-side resources); compiling information on other IRP assumptions that could be used to benchmark assumptions used in transmission planning, including plug-in hybrid vehicle market penetration, generation and transmission technology costs, and economic growth; compiling IRP load forecasts and documenting underlying assumptions and methods used to generate base case and alternate IRP load forecasts; evaluating the manner and degree to which IRPs consider resource options made available by additional transmission; evaluating the levels of renewables, CCS, nuclear, energy efficiency, demand response, and fossil generation evaluated within resource plans and the manner in which candidate resource portfolios are constructed and selected, including how risk is considered in portfolio selection. National Laboratory support in the evaluation of IRPs is needed beginning in the second quarter of 2010.

**Project 3 – Review of Load-Serving Entities' (LSEs) Integrated Resource Plans (IRPs) in relation to Renewable Energy Zones (REZs)**

**Need/Purpose:** National Laboratory support is needed in the Western Interconnection to conduct a consistent review of LSE IRPs and IRP updates across the interconnection to aid the identification of renewable energy zones of common interest to multiple LSEs. (Such identification is a key step toward the formation of business arrangements between LSEs, developers of renewable capacity, and transmission developers.) In addition, to assist in identifying renewable energy zones of interest to multiple LSEs and the formation of geographically specific LSE/PUC (Public Utility Commission) discussion groups, national Lab support is needed to utilize the Western Renewable Energy Zone (WREZ) delivered cost model for LSE/PUC discussion groups.

**Scope:** Data collected from such reviews would include planned renewable resource acquisitions (e.g., amounts of megawatts and megawatt hours, procurement schedules, resource type, locations including by renewable energy zone, related transmission projects). The review would examine and reconcile utility data submitted to WECC and IRP data and fill information gaps where there are no IRPs. Data on planned renewable resource acquisitions would be presented in tabular format by renewable energy zone,

state, year, utility, resource type. Lab support on electronic mapping of WREZ hubs, load areas, and procurement plans would accelerate and make more transparent the LSE discussions.

**b) Eastern Interconnection: Demand-side Resource Assessment and Characterization**

**Need/Purpose:** The Eastern Interconnection States' Planning Council seeks to significantly improve the knowledge base and modeling capabilities of demand-side resources, among other things, for purposes of transmission planning. These improvements are critical to the credibility of transmission expansion study work and the value of such work in formulating state and provincial policies.

**Scope:** National Laboratory support is needed to accurately estimate the demand-side resource technical and economic potential in the power system of the Eastern Interconnection. The lead National Lab selected for this work (and any associated contractors) will work directly with the Eastern Interconnection States' Planning Council to support their work. Contact with the Eastern Interconnection Planning Collaborative and its member Planning Authorities may also be required in order to support the work of the Eastern Interconnection States' Planning Council. Insight into possible demand-side tasks can be obtained by looking at methodologies and areas of work being pursued by the counterpart organization in the Western Interconnection, the Western Governors Association.

The selected National Lab's team may be directed to conduct the following activities, adapted from the Western Interconnection, but focused on the Eastern Interconnection:

- Quantifying the demand-side impacts for existing policies embedded in current load forecasts;
- Estimating the incremental economic and market-achievable potential of energy efficiency in load forecasts of Eastern Interconnection planning authorities and that may also be used by the Eastern Interconnection Planning Collaborative;
- Estimating the technical potential of energy efficiency for load forecasts for periods longer than available from existing load forecasts, up to at least 20 years;
- Updating the Federal Energy Regulatory Commission's *A National Assessment of Demand Response Potential* for derivation of demand response resource potential in load forecasts 10-years and 20-years in the future;
- Assess combined heat and power resources as well as other forms of distributed energy including but not limited to solar photovoltaics;
- Evaluate distribution system efficiency upgrades;
- Provide technical assistance to assemble and evaluate existing studies on demand-side resources and to harmonize and aggregate or extrapolate results as necessary to cover data gaps across the Eastern Interconnection. The emphasis will be on identifying studies that are of high quality and that have been completed recently enough to capture key changes in Federal (and state) appliance and lighting efficiency standards.

- Provide information to states about where future congestion is anticipated, and then an analysis of the potential for demand side resources to address that congestion, in comparison (including cost) to transmission solutions.
- An analysis/report detailing the historic cost of acquiring demand side resources, along with an analysis of the likelihood that such costs will persist or change significantly.
- Differentiate quantitatively between demand side potential in general, and demand side resources that qualify for PJM and ISO-NE forward capacity markets.
- Monitor and coordinate closely with the Eastern Interconnection Planning Collaborative's work on demand side issues and its efforts to improve the quality of demand side information submitted to it by its member Planning Authorities.
- Communicate results to non-technical audiences, including members of the Eastern Interconnection States' Planning Council.

**Area of Interest 3: Water/Energy Nexus**

**Need/Purpose:** DOE wishes to support the development of an integrated energy-water Decision Support System (DSS) that will enable planners in the Western and Texas Interconnections to analyze the potential implications of water stress for transmission and resource planning.

**Scope:** This DSS is to have two key elements:

**a)** **<u>A water use/consumption calculator for current and planned electric power generation.</u>** The inputs to the water-use calculator would be outputs from PROMOD IV (or equivalent, depending on the interconnection) projecting electricity production by generation facility on an hourly basis under a variety of scenarios. The calculator would then project water consumption and allow its disaggregation in various ways, such by watershed, state, basin, time intervals, and by different plant types or fuels. Researchers working on this task will need to determine or reconfirm water use requirements (gallons/MWh) for all existing plants, and develop agreed-upon assumptions for consumption rates for future plants according to plant characteristics and fuel type. These assumptions should include water use associated with plants using carbon capture and sequestration technology (including water used for carbon sequestration at locations other than the generation site). Researchers working on this task will need to coordinate with data sources and likely users of the water use calculator in each interconnection.

**b)** **<u>A regional water stress calculator.</u>** This calculator is to aid analysts in projecting locations and/or conditions under which the operations of existing or proposed generation capacity could be limited by water availability. This calculator must have two principal components:

**i.** **<u>A water demand projection model</u>,** disaggregated by municipal, industrial, mining, agriculture/livestock, and electricity production sectors. The model must be able to indicate whether the water is

expected to come from surface water, ground water, or other sources. The model must also be able to project total water demand associated with the alternative electricity future scenarios, using the same assumptions used in the scenarios for population growth, economic growth, per-capita water use, utilization of non-potable water, growth in the biofuels industry, and energy resource extraction (e.g., mining, oil shale, oil and gas production), etc.

ii. **A water availability model,** which is to have several elements:

A. Availability of "wet water": That is, how likely are water shortages to occur in a given basin. This would include the use of historic stream gauge data to determine the frequency with which demand is likely to exceed streamflow. Similarly, the potential for groundwater depletion can be assessed by comparing groundwater demand to base flow (a measure of sustainable groundwater recharge).

B. Even if "wet water" is available in a basin, that does not guarantee that an energy facility would have access to it. Accordingly, the availability of "paper" water must also be determined. This would provide some indication as to how difficult it might be to acquire a water right and how contentious water rights issues are in a basin. Several metrics or indicators should be considered here, including:
   1. The ratio of water use to compact limits.
   2. Whether rights are adjudicated in the basin.
   3. Administrative controls on a given basin.
   4. Number of suits filed over water/environment in a given basin.

**C. Other elements:**

1. Environmental considerations or controls that may limit withdrawals from a given river reach or groundwater basin.
2. Opportunities and cost estimates for alternative water development that could be used in support of energy facilities, including waste water, saline/brackish water, and produced water.
3. Estimates of potential cost of acquiring water rights, using data from past rights purchases and estimates of the values of rights to other users (agriculture, municipalities).
4. Assessment of the potential impacts of climate change on the metrics described above. Data from the International Panel on Climate Change (IPCC) scenario simulations would form the basis for future projections on supply. This sub-task would also include an estimation of the effects of various climate change scenarios on the current availability of electricity generated from hydro facilities.

5. Since there is no single metric sufficient to estimate water stress, a means of aggregating the information from each of the measures above will be required. Specifically, the DSS will need to allow the analyst to individually weight the various measures of water supply and combine them into an integrated measure of water stress as well as view each measure individually.
6. Enable calculation of changes in energy demand driven by increasing water use. The model should include energy to pump, treat, and convey water. This includes electricity for primary municipal water use, waste water, and irrigated agriculture.

**Area of Interest 4: Technical Assistance to Electric Infrastructure Planners on Other Subjects**

**Need/Purpose:** DOE has awarded $60M in ARRA funding to five parallel and closely related electric infrastructure planning entities in the three interconnections serving the continental United States. DOE is building an internal capability to provide consistent federal oversight, guidance, coordination, information, analysis, and technical support to the five awardees. DOE will require additional expertise and analytic capabilities to augment its in-house staff in carrying out these responsibilities and/or provide support to the awardees.

**Scope:** The lead Lab will be expected work closely with DOE leadership to identify and prioritize, and execute analyses and other activities needed to guide and support the work of the infrastructure planners. The work in this area of interest is expected to evolve over time in response to changes in the needs of the awardees and the priorities of the Department. The work may include preparation of technical analyses or reports on selected transmission planning topics, as requested of DOE by the awardees or as identified by the Department; assessment of the costs and performance characteristics of emerging electricity technologies; and resources ;multi-area production cost modeling; collection and evaluation of historic data related to transmission congestion; and economic and engineering analysis related to scenario planning.

## SECTION II – AWARD INFORMATION

### A. TYPE OF AWARD INSTRUMENT

DOE anticipates providing DOE funding for selected projects to National Laboratories. Any project awarded as a result of the Research Call will be processed through NETL as a Field Work Proposal, an Interoffice Work Order, Interagency Agreement or any other allowable method deemed appropriate by the Government

### B. ESTIMATED FUNDING

- Approximately $19.5 million is expected to be available for new awards under this Announcement.

- An approximate breakdown of funding per area of interest is as follows:

  Area of Interest 1: Interregional Electricity Reliability Issue Assessment and Analysis

  - Expected Funding: Up to $1.5 M/year for 3 years – a total of $4.5M

  Area of Interest 2: New Technologies and Electricity Demand

  - Expected funding: Up to $1.3 M/year for 3 years – a total of $4.0M

  Area of Interest 3: Water/Energy Nexus

  - Expected funding: Up to $1.3 M/year for 3 years – a total of $4.0M

  Area of Interest 4: Technical Assistance to Electric Infrastructure Planners on Other Subjects

  - Expected funding: Up to $2.3M/year for 3 years – a total of $7.0M

## C. EXPECTED NUMBER OF AWARDS

DOE anticipates making 4 to 6 awards under this announcement. The Government reserves the right to fund, in whole or in part, any, all, or none of the proposals submitted in response to this Research Call and will award that number of instruments which serves the public purpose and is in the best interest of the Government.

## D. ANTICIPATED AWARD SIZE

DOE anticipates that it will issue several awards of varying size summing to about $19.5 million. This information is for estimating purposes only and in no way commits the Government.

## E. PERFORMANCE PERIOD

DOE anticipates making awards within 77 days from the date of release of this Research Call with a performance period consistent with "B. ESTIMATED FUNDING." Shorter-term delivery dates may be required for specific analytic tasks. Longer-term projects may be divided into phases, with go/no-go decision points at end of each phase. A decision will be made regarding continuation, redirection, or termination of the project at each decision point.

## F. TYPE OF PROPOSAL

DOE will accept only new proposals under this Research Call -- no requests for renewal of a current project.

## SECTION III – ELIGIBILITY INFORMATION

### A. ELIGIBLE OFFERORS

Only DOE National Laboratories are eligible to apply as prime. They are responsible for organizing and leading the project team. Collaborations involving educational institutions, industrial companies, and R&D organizations is encouraged.

## SECTION IV – SUBMISSION REQUIREMENTS

### A. SUBMISSION INSTRUCTIONS

Proposals shall be submitted electronically to the following email address no later than May, 3 2010 at 11:59:59 PM Eastern Daylight Time:

Brian Mollohan, P.E.
DOE/NETL/Energy Delivery Technologies Division
3610 Collins Ferry Road
Morgantown, WV 26507-0880
Phone: (304) 285-1367
Fax: (304) 285-4403
E-mail: brian.mollohan@netl.doe.gov

The applicant is encouraged to request a return notification to verify receipt of proposal.

## SECTION V – EVALUATION AND SELECTION

### A. INITIAL REVIEW CRITERIA

Prior to a comprehensive merit evaluation, DOE will perform an initial review to determine that (1) the applicant is eligible for an award; (2) the information required by the Research Call has been submitted; (3) all mandatory requirements are satisfied; and (4) the proposed project is responsive to the objectives of the Research Call.

### B. MERIT REVIEW CRITERIA

Proposals submitted in response to this Research Call will be evaluated and scored in accordance with the criteria and weights listed below:

**Criterion 1: Needs Assessment (25%)**

- Comprehensiveness of the Applicant's proposal in demonstrating a thorough understanding of resource assessment techniques, and the models, data needs, and analytic approaches used to project the capacity and design of infrastructure facilities needed to maintain electric reliability in an Interconnection under a wide range of alternative futures.
- Comprehensiveness of the Applicant's proposal in demonstrating a thorough understanding of the challenges in the analysis and/or the development of models or other tools needed to perform tasks that DOE may assign in the given area of technical interest.

**Criterion 2: <u>Technical Approach and Project Management</u> (25%)**

- Adequacy and feasibility of the Applicant's approach to ensure that DOE's goals and objectives will be met in the area of interest.
- Adequacy and feasibility of the Applicant's approach to address and resolve technical challenges in the development of long-term Interconnection-wide transmission expansion plans.
- Validity and completeness of the proposed technical approach and likelihood of success based on the current status of the proposed technology and the scientific merit of the proposed approach.
- Adequacy, reasonableness, and soundness of the proposed project management plan.
- Adequacy, appropriateness, and reasonableness of the proposed work and budget distribution among the team members to accomplish the stated objectives.
- Degree to which the project would be performed in a transparent and collaborative manner, and study processes would be open to significant stakeholder bodies, including appropriate entities in Canada and Mexico.
- Degree to which the Applicant's approach would help lead to consensus (as much as possible) among the stakeholders on key issues.

**Criterion 3: Outreach and Impact (25%)**

- Extent to which the Applicant's proposal presents an effective process for gaining a thorough understanding of FOA selectees' needs in a particular subject area, taking into account the diversity of the affected selectee's membership and their concerns.
- Extent to which the Applicant's proposal presents a effective process for determining whether or how specific NGOs or their members need to be consulted or otherwise involved in an analysis in a given subject area in order to achieve DOE's objectives and those of the FOA selectees.
- Extent to which the Applicant's approach would lead to dissemination of lessons learned and foster collaboration with entities not immediately involved with the project.

**Criterion 4: <u>Relevant Experience and Capabilities</u> (25%)**

- Credentials, capabilities and experience of key personnel.

- Demonstrated experience of the project team (Applicant, consultants, collaborators, subcontractors) in performing analysis and planning for power systems and related infrastructure and resources.
- Clarity, logic and likely effectiveness of project organization, including the project steering group.
- Degree of commitment of the project team as evidenced by letters of commitment from team members, other than the Applicant.
- Ability to deliver programmatic result and accountability objectives included in the American Recovery and Reinvestment Act of 2009.

## C. SUBMISSIONS FROM SUCCESSFUL OFFERORS

If selected for award, DOE reserves the right to request additional or clarifying information for any reason deemed necessary, including, but not limited to:

- Indirect cost information;
- Other budget information;
- Plan for compliance with National Environmental Policy Act (NEPA); and
- Name and contact information of the cognizant Contracting Officer.

## D. FUNDING RESTRICTIONS

American Recovery and Reinvestment Act of 2009 (ARRA 2009)
Projects under this Research Call will be funded, in whole or in part, with funds appropriated by the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, (Recovery Act or Act). The Recovery Act's purposes are to stimulate the economy and to create and retain jobs. Accordingly, special consideration will be given to projects that promote and enhance the objectives of the Act, especially job creation, preservation and economic recovery, in an expeditious manner.
Be advised that special terms and conditions may apply to projects funded by the Act relating to:

- Reporting, tracking and segregation of incurred costs;
- Reporting on job creation and preservation;
- Publication of information on the Internet;
- Access to records by Inspectors General and the Government Accountability Office;
- Prohibition on use of funds for gambling establishments, aquariums, zoos, golf courses or swimming pools;
- Ensuring that iron, steel and manufactured goods are produced in the United States;
- Ensuring wage rates are comparable to those prevailing on projects of a similar character;
- Protecting whistleblowers and requiring prompt referral of evidence of a false claim to an appropriate inspector general; and
- Certification and Registration.

These special terms and conditions will be based on provisions included in Titles XV and XVI of the Act. The exact terms and conditions will be provided as soon as available. The Office of Management and Budget (OMB) has issued Initial Implementing Guidance for the Recovery Act. See M-09-10, Initial Implementing Guidance for the American Recovery and Reinvestment Act of 2009. OMB will be issuing additional guidance concerning the Act in the near future. Applicants should consult the DOE website, www.energy.gov, the OMB website http://www.whitehouse.gov/omb/, and the Recovery website, www.recovery.gov regularly to keep abreast of guidance and information as it evolves.

Recipients of funding appropriated by the Act shall comply with requirements of applicable Federal, State, and local laws, regulations, DOE policy and guidance, and instructions in this Research Call, unless relief has been granted by DOE. Recipients shall flow down the requirements of applicable Federal, State and local laws, regulations, DOE policy and guidance, and instructions in this Research Call to subrecipients at any tier to the extent necessary to ensure the recipient's compliance with the requirements. Be advised that Recovery Act funds can be used in conjunction with other funding as necessary to complete projects, but tracking and reporting must be separate to meet the reporting requirements of the Recovery Act and related OMB Guidance. Applicants for projects funded by sources other than the Recovery Act should plan to keep separate records for Recovery Act funds and ensure those records comply with the requirements of the Act. Funding provided through the Recovery Act that is supplemental to an existing grant is one-time funding.

Applicants should begin planning activities for their first tier subawardees, including obtaining a DUNS number (or updating the existing DUNS record) and registering with the Central Contractor Registration (CCR). The extent to which subawardees will be required to register in CCR will be determined by OMB at a later date.

## SECTION VI – APPLICATION PREPARATION

### A. PREPARATION

It is requested that the entire proposal be single spaced, 1" margins (top, bottom, left, right), and when printed will fit on size 8 1/2" by 11" paper. The type must be legible and not smaller than 11 point. In order to produce a comprehensive application for this Research Call, the offeror shall address, at a minimum, the areas listed in the Table of Contents below. The offeror shall use the following Table of Contents:

| **Section** | **Page** |
|---|---|
| Table of Contents | I |
| List of Tables (if applicable) | II |
| List of Figures (if applicable) | III |
| List of Acronyms | IV |
| Technical Content | # |
| - Technical Objectives. | # |
| Qualifications and Resources | # |

| | |
|---|---|
| Project Summary | A |
| Resume File | B |
| Budget Files | C |
| Budget Justification File | D |

- A proposal should address only one technical area of interest and the entire area of interest.
- DOE reserves the right to disqualify any proposal that addresses multiple technical areas of interest.
- A lead Lab may submit a separate proposal for each technical area of interest
- A Lab may serve as a team member on multiple proposals.

The entire proposal, that includes all materials included in the Table of Contents, should be saved as a single PDF file under the following file name: "AoI *number* - *lab name* - *PI*", e.g., "AoI1 – NETL – Mollohan", "AoI3 – NETL – Smith"

## B. TECHNICAL CONTENT

The Technical Content must not exceed twenty 20 pages, when printed using standard 8.5" by 11" paper with 1" margins (top, bottom, left, and right). EVALUATORS WILL REVIEW ONLY THE NUMBER OF PAGES SPECIFIED IN THE PRECEDING SENTENCE. The font must not be smaller than 11 point. Do not include any Internet addresses (URLs) that provide information necessary to review the proposal. See Part VII.G for instructions on how to mark proprietary proposal information.

*Technical Objectives.*
This section should include adequate background of how the proposed research will address the technical area of interest, to which the lab is proposing. In addition, the lead Lab is encouraged to directly address the Merit Review Criteria included in Section V-B

## C. QUALIFICATIONS AND RESOURCES.

This section should include evidence of current organization experience and success in similar projects which lead to successful technology development. This section should include adequate discussion of experience. Finally, this section should include adequate discussion of adequacy (quality, availability and appropriateness) of facilities and equipment to accommodate the proposed project.

## D. PROJECT SUMMARY

The project summary/abstract must contain a summary of the proposed activity suitable for dissemination to the public. It should be a self-contained document that identifies the name of the offeror and other team members, the project director/principal investigator(s), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (i.e., benefits, outcomes). This document must not include any proprietary or sensitive business information as DOE may make it available to the public. The project summary must not exceed 2 pages when printed using standard 8.5" by 11" paper with 1" margins (top, bottom, left and right) with font not smaller than 11 point.

## E. RESUME FILE

Provide a resume for each key person proposed, including subawardees and consultants if they meet the definition of key person. A key person is any individual who contributes in a substantive, measurable way to the execution of the project.

Each resume must not exceed 2 pages when printed on 8.5" by 11" paper with 1" margins (top, bottom, left, and right) with font not smaller than 11 point and should include the following information, if applicable:

*Education and Training*: Undergraduate, graduate and postdoctoral training, including institution, major/area, degree and year.

*Professional Experience*: Beginning with the current position list, in chronological order, professional/academic positions with a brief description.

*Publications*: Provide a list of up to 10 publications most closely related to the proposed project. For each publication, identify the names of all authors (in the same sequence in which they appear in the publication), the article title, book or journal title, volume number, page numbers, year of publication, and website address if available electronically. Patents, copyrights and software systems developed may be provided in addition to or instead of publications.

*Synergistic Activities*: List no more than 5 professional and scholarly activities related to the effort proposed.

## F. BUDGET FILES

Provide Budget Summary tables for the total project and for each year of the project. The tables should include estimated costs for various budget categories such as personnel (including fringe benefits), equipment, materials and supplies, travel, subcontract, and other direct costs and indirect costs (general and administrative).

## G. BUDGET JUSTIFICATION FILE

You must justify the costs proposed in each Cost Category (e.g., identify key persons and personnel categories and the estimated costs for each person or category; provide a list of equipment and cost of each item; identify proposed subaward/consultant work and cost of each subaward/consultant; describe purpose of proposed travel, number of travelers and number of travel days; list general categories of supplies and amount for each category; and provide any other information you wish to support your budget). Provide the name of your cognizant/oversight agency, if you have one, and the name and phone number of the individual responsible for negotiating your indirect rates.

# SECTION VII – OTHER INFORMATION

## A. STATEMENT OF WORK INSTRUCTIONS

The selectees under this research call shall prepare a statement of work for each of the awards that they receive. See Attachment A

## B. PROJECT MANAGEMENT PLAN

The selectees under this research call shall prepare a project management plan for each of the awards that they receive. See Attachment B

## C. MODIFICATIONS

Notices of any modifications to this Research Call will sent directly to the National Laboratories.

## D. GOVERNMENT RIGHT TO REJECT OR NEGOTIATE

DOE reserves the right, without qualification, to reject any or all proposals received in response to this Announcement and to select any proposal, in whole or in part, as a basis for negotiation and/or award.

## E. EVALUATION AND ADMINISTRATION BY NON-FEDERAL PERSONNEL

In conducting the merit review evaluation, the Government may seek the advice of qualified non-Federal personnel as reviewers. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The offeror, by submitting its proposal, consents to the use of non-Federal reviewers/administrators. Non-Federal reviewers must sign conflict of interest and non-disclosure agreements prior to reviewing a proposal. Non- Federal personnel conducting administrative activities must sign a non-disclosure agreement.

## F. NOTICE REGARDING ELIGIBLE/INELIGIBLE ACTIVITIES

Eligible activities under this program include those which describe and promote the understanding of scientific and technical aspects of specific energy technologies, but not those which encourage or support political activities such as the collection and dissemination of information related to potential, planned or pending legislation.

# APPENDICES / REFERENCE MATERIALS

## APPENDIX A – DEFINITIONS

**"Amendment"** means a revision to a Program Announcement.

"**Budget**" means the cost expenditure plan submitted in the Proposal, including both the DOE contribution.

"**Consortium (plural consortia)**" means the group of organizations or individuals that have chosen to submit a single Proposal in response to a Program Announcement.

"**Contracting Officer**" means the DOE official authorized to execute Awards on behalf of DOE and who is responsible for the business management and non-program aspects of the Acquisition process.

**"Central Contractor Registry (CCR)"** is the primary database which collects, validates, stores and disseminates data in support of agency missions. Program Announcements which require proposal submission through Grants.gov require that the organization first be registered in the CCR at http://www.grants.gov/CCRRegister.

**"E-Business Point of Contact (POC)"** is the individual who is designated as the Electronic Business Point of Contact in the CCR registration. This person is the sole authority of the organization with the capability of designating or revoking an individual's ability to submit grant applications on behalf of their organization through Grants.gov.

"**Key Personnel**" means the individuals who will have significant roles in planning and implementing the proposed Project on the part of the Offeror and Participants.

"**Offeror**" means the legal entity or individual signing the Proposal. This entity or individual may be one organization or a single entity representing a group of organizations (such as a Consortium) that has chosen to submit a single Proposal in response to a Program Announcement.

"**Participant**" for purposes of this Program Announcement only, means any entity, except the Offeror substantially involved in a Consortium, or other business arrangement (including all parties to the Offeror at any tier), responding to the Program announcement.

"**Project**" means the set of activities described in a Proposal, State plan, or other document that is approved by DOE for funding.

**"Proposal"** is the term used in DOE's Industry Interactive Procurement System (IIPS) meaning the documentation submitted in response to a Program Announcement.

"**Selection**" means the determination by the DOE Selection Official that negotiations take place for certain Projects with the intent of awarding funding.

**"Selection Official"** means the DOE official designated to select Proposals for negotiation toward Award under a subject Program Announcement.

"**Total Project Cost**" means all the funds to complete the effort proposed by the Offeror.

## APPENDIX B - ACRONYMS

AOI – Area of Interest
ARRA – American Recovery and Rehabilitation Act

CCR - Central Contractor Registration
CCS - Carbon Capture And Sequestration
DOE – Department of Energy
DSS – Decision Support System
EIPC - Eastern Interconnection Planning Coalition
EISPC - Eastern Interconnection States Planning Council
ERCOT - Electric Reliability Council of Texas
FERC - Federal Energy Regulatory Commission
FOA – Funding Opportunity Announcement
IPCC - International Panel on Climate Change
IRP - Integrated Resource Plan
ISO - Independent System Operator
ISO-NE - Independent System Operator – North East
LSE – Load Serving Entities
M – Million
MWh – Mega-Watt Hour
NEPA - National Environmental Policy Act
NERC - North American Electric Reliability Corporation
NETL – National Energy Technology Laboratory
NGO - Non-Governmental Organizations
OMB - Office of Management and Budget
PI – Principal Investigator
POC – Point Of Contact
PUC – Public Utility Commission
R&D – Research and Development
REZ – Renewable Energy Zone
RTO - Regional Transmission Organization
WECC - Western Electricity Coordinating Council
WGA - Western Governors' Association

## ATTACHMENT A - STATEMENT OF WORK INSTRUCTIONS

A Statement of Work shall be developed that addresses how the project objectives will be met. The Statement of Work must contain a clear, concise description of all activities to be completed during project performance and follow the structure discussed below. The Statement of Work may be released to the public by DOE in whole or in part at any time. It is therefore required that it shall not contain proprietary or confidential business information.

TITLE OF WORK TO BE PERFORMED

(Insert the title of work to be performed. Be concise and descriptive. Avoid non-descriptive terms, such as 'novel' or 'innovative')

A. OBJECTIVES

Include one paragraph on the overall objective(s) of the work. Also, include objective(s) for each phase of the work.

B. SCOPE OF WORK

This section should not exceed one-half page and should summarize the effort and approach to achieve the objective(s) of the work for each Phase.

C. TASKS TO BE PERFORMED

Tasks, concisely written, should be provided in a logical sequence and should be divided into the phases of the project, as appropriate. This section provides a brief summary of the planned approach to this project. An outline of the Project Management Plan (referenced in Task 1.0 below and submitted with your application) is provided later in this Part.

PHASE I

Task 1.0 – Project Management and Planning
(Description includes work elements required to revise and maintain the Project Management Plan and to manage and report on activities in accordance with the plan)

Subtask 1.1 (Optional)

(Description)

Task 2.0 - (Title)

PHASE II (Optional)

Task 3.0 - (Title)

D. DELIVERABLES

The periodic, topical, and final reports shall be submitted in accordance with the attached "Federal Assistance Reporting Checklist" and the instructions accompanying the checklist. [Note: The Recipient shall provide a list of deliverables other than those identified on the "Federal Assistance Reporting Checklist" that will be delivered. These reports shall also be identified within the text of the Statement of Project Objectives.] See the following examples:

- Task 1.1 - (Report Description)
- Task 2.2 - (Report Description)

E. BRIEFINGS/TECHNICAL PRESENTATIONS (If applicable)

The Recipient shall prepare detailed briefings for presentation to the DOE Project Officer. Location(s) and time(s) shall be done by mutual agreement between the Project Officer and the recipient.

## ATTACHMENT B - PROJECT MANAGEMENT PLAN INSTRUCTIONS

A project management plan shall be developed that clearly indicates how the projects will be managed. The Project Management plan may be released to the public by DOE in whole or in part at any time. It is therefore required that it shall not contain proprietary or confidential business information.

PROJECT MANAGEMENT PLAN

{Agreement Title}[1]

{Date Prepared}

WORK PERFORMED UNDER AGREEMENT

DE-xxxxxxxxxxxxxx

SUBMITTED BY

{Organization Name}
{Organization Address}
{City, State, Zip Code}

PRINCIPAL INVESTIGATOR

{Name}
{Phone Number}
{Fax Number}
{E-Mail}

SUBMITTED TO

U. S. Department of Energy
National Energy Technology Laboratory

{FPM Name}
{FMP Email}

[1]NOTE: { } denotes required information.

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## 1. EXECUTIVE SUMMARY

Provide a description of the project that includes the objective, project goals and expected results. The summary should also include a succinct project background and project rationale. For purposes of the application, this information should be a summary of the pertinent information that is included in the proposal so that the Project Management Plan is a stand-alone document.

## 2. RISK MANAGEMENT

The Applicant (Recipient) shall provide a summary description of the proposed approach to identify, analyze, and respond to perceived risks associated with the proposed project. Project risk events are uncertain future events that, if realized, impact the success of the project. Since risk is inherent to all projects, regardless of the level of complexity, cost or visibility, project risk must be addressed to the appropriate level for every project. It is recognized that the depth of analysis and the complexity and cost of the resulting risk management approach (and plan) will differ from project to project and among organizations. Commonly accepted approaches, such as those supported by The Project Management Institute's A Guide to the Project Management Book of Knowledge, should be considered.

As a minimum, the Applicant (Recipient) should provide sufficient information with the application to demonstrate an appropriate approach to managing risks during project execution. This must include the initial identification of significant technical, resource and management issues that have the potential to impede project progress and strategies to minimize impacts from those issues. For fundamental research and modeling studies it is anticipated that risks would focus on technical uncertainties that are the result of this type of work.

## 3. MILESTONE LOG

The Applicant (Recipient) is to provide milestones for each budget period of the project. Each milestone is to include a title, planned completion date and a description of the method/process/measure used to verify completion. The milestones developed should be quantitative and show progression towards budget period and/or project goals. It is expected that the Applicant (Recipient) will have a milestone at least semi-annually or every six months of the project schedule: however, milestones should not be developed to meet this expected schedule. Milestones are different than success criteria (Section 6) in that milestones typically show progress through the execution of the budget period and project, whereas success criteria are used by the DOE to determine if specific goals were met at budget period ends or other appropriate points in project execution.

Format for the milestone log should be as follows:

**Title**: {Milestone Title}
**Planned Date**: {Planned Completion Date}
**Verification Method**: {Milestone Verification Method}

## 4. FUNDING AND COSTING PROFILE

The Applicant (Recipient) shall provide a table that shows, by budget period, the amount of government funding going to each member and cost share (if any) provided by members. The table shall also calculate totals and cost sharing percentages. Table 1 "Project Funding Profile" below is an example.

The Applicant (Recipient) shall also provide a table that projects, by month, the expenditure of the government funds in the current budget period, as a minimum. While it is recognized that out year costing profiles are less certain and the nature of specific tasks are dependent on successful or unsuccessful completion of the current RD&D approach, the Applicant (Recipient) should provide their estimates of out year costs to the extent practical. Table 2 – "Project Spending Plan" provides an example. Note that the spending plan total equals the BP 1 total government funds ($725,000) and that BP 1 is 12 months in duration; budget periods can be more or less than 12 months in duration.

## 5. PROJECT TIMELINE

The Applicant (Recipient) shall provide a timeline of the project broken down by each task and subtask, as described in the Statement of Project Objectives. The timeline shall include for each task, a start date, end date, approximate cost and team members participating on the task and their role. The timeline shall also show any interdependencies with other tasks and note the milestones identified in the Milestone Log (Section 3). It is highly recommended that the Applicant (Recipient) consider using a commercial software package to generate the timeline as a Gantt chart (see Figure 1 as an example) or other applicable format.

## 6. SUCCESS CRITERIA AND DECISION POINTS

The success criteria should be objective and stated in terms of specific, measurable and repeatable data. Usually, the success criteria pertain to desirable outcomes, results and observations from the experimental efforts. The success criteria should not be based on interpretations. Typically, the expected performance parameters should be established with a technical and economic comparison made to the competing technologies or methods. A discussion should be included on the probable advantages and possible disadvantages. Advantages could include, but are not limited to:

- Validation/confirmation/identification of scientific/engineering knowledge
- Cost savings expected over existing technologies
- Performance enhancements to existing technologies
- Reduction in health and safety risks to the public and workers, and reduction in environmental risks.
- Ease of installation, operation, and maintenance.
- Decrease in capital, operating, and maintenance cost.

Success Criteria are different than milestones (Section 3) in that milestones typically show progress through the execution of the budget period and project, whereas success criteria are used by the DOE to determine if specific goals and objectives were met at budget period ends. Typically, these goals and objectives represent requirements established by the R&D program as evidence of progress in advancing a technology area or scientific/engineering knowledge. The success criteria may be used to assist DOE in deciding whether to proceed into subsequent budget period(s), if required.

## 7. AGREEMENT STATEMENT OF PROJECT OBJECTIVES

The Statement of Work (SOW) from the Agreement will be inserted here. Note that Task 1.0 (or other designation) of the SOW entails the work necessary to manage the project and to update the Project Management Plan submitted with the application. The Project Management Plan submitted as a work product under Task 1.0 (or other designation) serves as the base project cost, schedule and scope and is the basis for reporting quarterly progress in the Progress Report defined in the ”Federal Assistance Reporting Checklist and Instructions”

**Table 1 – Project Funding Profile**

| | **BP 1** | | **BP 2** | | **BP 3** | | **Total** | |
|---|---|---|---|---|---|---|---|---|
| | **Gov. Funding** | **Cost Share** | **Gov. Funding** | **Cost Share** | **Gov. Funding** | **Cost Share** | **Gov. Funding** | **Cost Share** |
| **Prime Applicant (Recipient)** | $650,000 | $200,000 | $500,000 | $200,000 | $450,000 | $250,000 | $1,600,000 | $650,000 |
| **Team Member (1)** | $75,000 | $25,000 | $100,000 | $30,000 | $50,000 | $0 | $225,000 | $55,000 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Team Member** | $0 | $0 | $50,000 | $0 | $75,000 | $0 | $125,000 | $0 |
| **Team Member** | | | | | | | | |
| **Total:** | **$725,000** | **$225,000** | **$650,000** | **$230,000** | **$575,000** | **$250,000** | **$1,950,000** | **$705,000** |
| **CS %:** | | **23.7%** | | **26.1%** | | **30.3%** | | **26.6%** |

(1) A Team Member is typically an organization participating on the project. It is typically not an individual person unless that person serves as a consultant or the single representative of a company.

**Table 2 – "Project Spending Plan"**

| **BP1 – Nov. 2004 – Oct. 2005** | |
|---|---|
| November | 25 |
| December | 100 |
| January | 50 |
| February | 50 |
| March | 75 |
| April | 75 |
| May | 75 |
| June | 75 |
| July | 50 |
| August | 75 |
| September | 50 |
| October | 25 |
| **Total ($s in thousands)** | **725** |

**Figure 1 – Sample Project Timeline (Gantt Chart)**

| **Year** | 2007 | | | | 2008 | | | | 2009 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Quarter** | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Task 1.0 Project Management and Planning | | | | | | | | | | | | |
| Task 2 .0 Descriptive Title | | | | | | | | | | | | |
| Subtask 2.1 Descriptive Title | | | **A** | | | | | | | | | |
| Subtask 2.2 Descriptive Title | | | | | | B | | | | | | |
| Task 3.0 Descriptive Title | | | | | | | | C, 1 | | | | |
| Subtask 3.1 Descriptive Title | | | | | | | | | D | | | |
| Subtask 3.2 Descriptive Title | | | | | | | | | | | | |
| Continue with Additional Phases & Tasks | | | | | | | | | | | | |

A, B, C etc. – Milestones from Milestone Log

1,2,3 etc – Decision Points

Note: Timelines for each task and subtask has an associated level of effort, typically budgeted cost